Quarterly Report
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OBJECTIVES

1. To study and understand vegetation index behavior over different biomes and different periods of the year.

2. To standardize vegetation indices to external and internal measurement conditions (atmosphere, sun and view angles, ground contamination).

3. To functionally couple vegetation index products to plant biophysical parameters.

TASK PROGRESS

Considerable effort was expended in collecting, documenting, and archiving ground-, air-, and satellite-based data sets for vegetation index development work. These data sets are over Walnut Gulch, 1990, 1991, and 1992; Maricopa 1989, 1991; and Niger 1991 & 1992. In addition an AVHRR data set was assembled by the EROS Data Center over the major biome types of North America and the first round of our MSS international test sites was completed.

1. AVHRR Study Sites:

The EROS Data Center has compiled a 57 site, North American AVHRR data set, which includes daily daytime data from 1989-1992. This daily data set includes all 5 channels as well as angular (sun and view) data. I sent a graduate student to work with Joy Hood of the EDC in conducting a preliminary analysis of the value of this data set to the Modland group. The student spent 4 weeks at the EDC, using S plus software on Unix Workstations. The student wrote various compositing' subroutines using different vegetation indices and has transferred a similar set in Tucson to continue processing this data cooperatively with EDC.

2. MSS-Test Sites:

The global MSS test site selection for initial development of MODIS land cover, vegetation index, and other land related objectives was submitted to the EDC. 45 MSS scenes covering LTER, IGBP, IBP, MAB, NPS, and Eos-IDS study areas are being provided to us from EDC in Sioux Falls. A preliminary data set was distributed so that the Modland group can decide on the appropriate format and

packaging of this data. Our lab was able to read the data and display the imagery.

3. Vegetation Index Summary Document:

A Vegetation Index Workshop was held on June 22, 1992 at NASA/GSFC. A report of this workshop with directions for the development of the MODIS vegetation index p roducts is now complete and versions of this were sent out by e-mail and distributed at the MODIS Science Team Meeting (Oct. 1992). This document is now being revised for submittal to a peer review journal in the form of a letter.

4. MODLAND Land Cover Meeting:

A land cover meeting, hosted by Steve Running, was held at Flathead Lake, Montana on September 21-23. All MODIS products that will aid in the development of the land cover product were discussed and evaluated. In addition data sets needed for the development effort were discussed. The 1992 Walnut Gulch data set, which includes a multitemporal sequence of TM images from April through November was deemed to be a valuable data set in developing multitemporal spectral profiles for possible inclusion in the land cover product. Chris Justice and I also volunteered to attend an NSF LTER - NASA meeting at Sevilleta, New Mexico (Nov. 11-13)

in order to coordinate a cooperative land cover study agreement with the NSF LTER sites. NASA will supply the LTER sites with TM imagery, Modland will perform land cover and land cover change algorithms, and the NSF team will verify the classification and change detection as well as provide biophysical vegetation information and possibly atmospheric optical depth data.

5. China Test Sites:

A Chinese delegation from the National Academy of Sciences in Beijing visited Tucson, Arizona in late August to discuss a mutual cooperative interest in developing a network of Chinese test sites crossing a gradient of ecological and climatic zones from the Temperate Pine forests to the north to the Tropical forests to the south. A tentative time period in March was set up for me to visit a subset of these sites. Furthermore, the Chinese test site locations were submitted to the EDC and they have successfully located 7 clear images of the 9 sites for MSS imagery. These sites have been integrated into the Modland MSS test site strategy.

6. Niger-HAPEX Activities:

The Niger-Hapex experiment campaign was largely a success. I had two graduate students spend 5 months collecting ground radiometric and vegetation biophysical data throughout the growing season. Furthermore, I spent 2 weeks there during the intensive measurement campaign which involved the C-130 NASA aircraft. ASAS

data was successfully collected at all the subsites which included millet, grassland, degraded shrub, fallow, and tiger-bush plateau. This complete data set parallels the Walnut Gulch data set, both of which involved ASAS, TM & SPOT satellite, multitemporal light aircraft with Exotech and IRT, and ground radiometry with Exotech and Spectron SE 590 data. The ground data set is being processed now.

7. Microwave & Optical Compositing Approach

One graduate student is at the LERTS lab in Toulouse, France under an Eos-IDS exchange program. He is working on possible compositing' approaches to the Vegetation Index Algorithm for purposes of producing Level 3, weekly to monthly vegetation index products. One approach he is currently working on involves the use of microwave imagery to "fill" in the cloudy days of the AVHRR passes. He hopes to use the microwave to clean up the AVHRR compositing approach.

NEXT QUARTER ACTIVITIES

1. Complete the "letter" publication of the Vegetation Index Workshop document and submit to Intl. Journal of Remote Sensing as a form of "peer review". In addition, the validation and evaluation results of the report will be tested on preliminary data sets and will then be submitted as a formal manuscript for peer review. The final manuscript version will also be presented at the "Remote Sensing of Soils and Vegetation" Workshop to be held in Tempe, Arizona on 6-8 January 1993.

2. Prepare a presentation on the Modland land cover product to the NASA & NSF-LTER meeting, November 11-13.

3. Continue processing the ASAS data of Walnut Gulch. Implement the atmosphere correction based on measured optical depth data and start a MODIS simulation of channels 1-4. Similarly simulate MODIS imagery from the TM scenes of Walnut Gulch.

4. Finish the product flow diagram for SDST and link to all other Modland products.

5. Start working on compositing methodologies and vegetation index algorithms with the AVHRR test site data sets provided by the EDC.

6. Start a full scale accuracy and error analyses on the various vegetation index algorithms to streamline the product list and detect critical' areas in need of more careful attention.

PUBLICATIONS

Huete, A.R., Hua, G., Qi, J., Chehbouni, A., and Leeuwen, van W.J.D., 1992, Normalization of multidirectional red and NIR reflectances with the SAVI, Remote Sens. Environ. 41:143-154.

Huete, A.R. 1992, Extraction of soil and vegetation parameters from high resolution bi-directional reflectance spectra, Presented at IGARSS 92 Symposium, Houston, Texas May 25-29, 1992, Vol. 1, pp. 752-754.